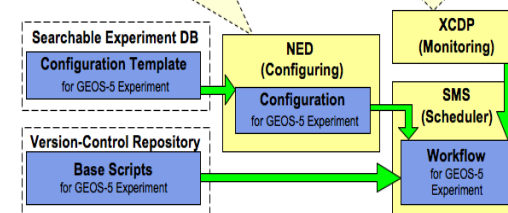# Thinking Beyond the Box

Tsengdar Lee
Presented to Climate in a Box workshop

March 22, 2010
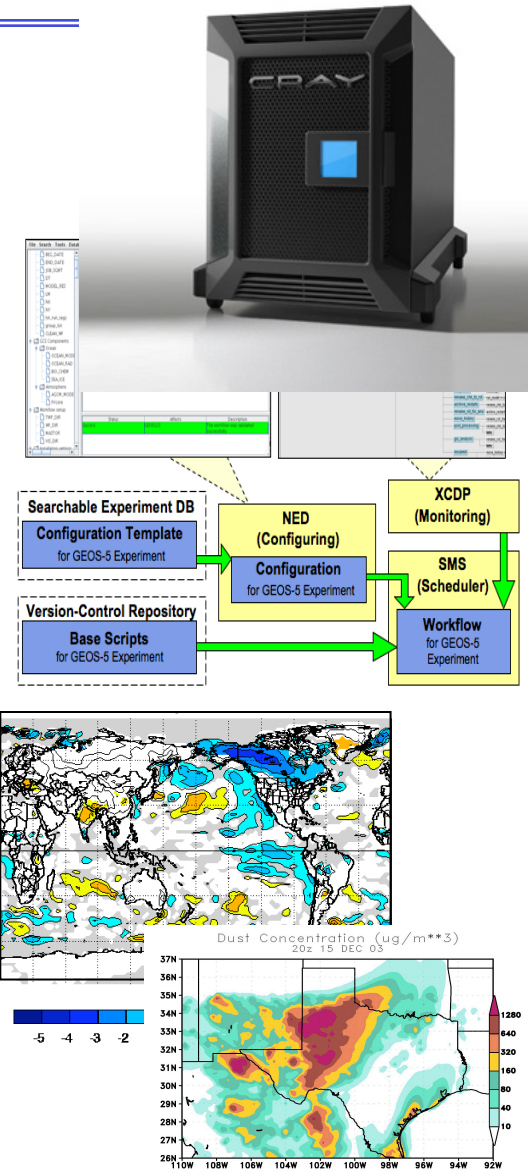
Lower the Bar for Entry – Model Developers

- Low cost computing platform (e.g. Cray CX1 w/ MS HPC 2008 or Redhat Linux)
- Atmosphere/Ocean models (Model-E, WRF, GEOS-5, CCSM, GFS)
- Earth System Modeling Framework & MAP Library (ESMF/MAPL)
  - Componentized architecture to reduce software engineering complexity
- Data (MERRA, SST, NCEP/NCAR reanalysis)
- Modeling Workflow
  - Model configuration, experiment design, and input output data management
  - Tracking of experiments
  - Share experiment designs
- Development environment with compiler and debugger (e.g. eclipse, MS Visual Studio)
- Visualization Software (e.g. IDL, MatLab)
- Startup AMIP, CMIP, weather, and S/I runs
- MERRA scout run, ECMWF nature run
- Scenarios, OSSE, OSE
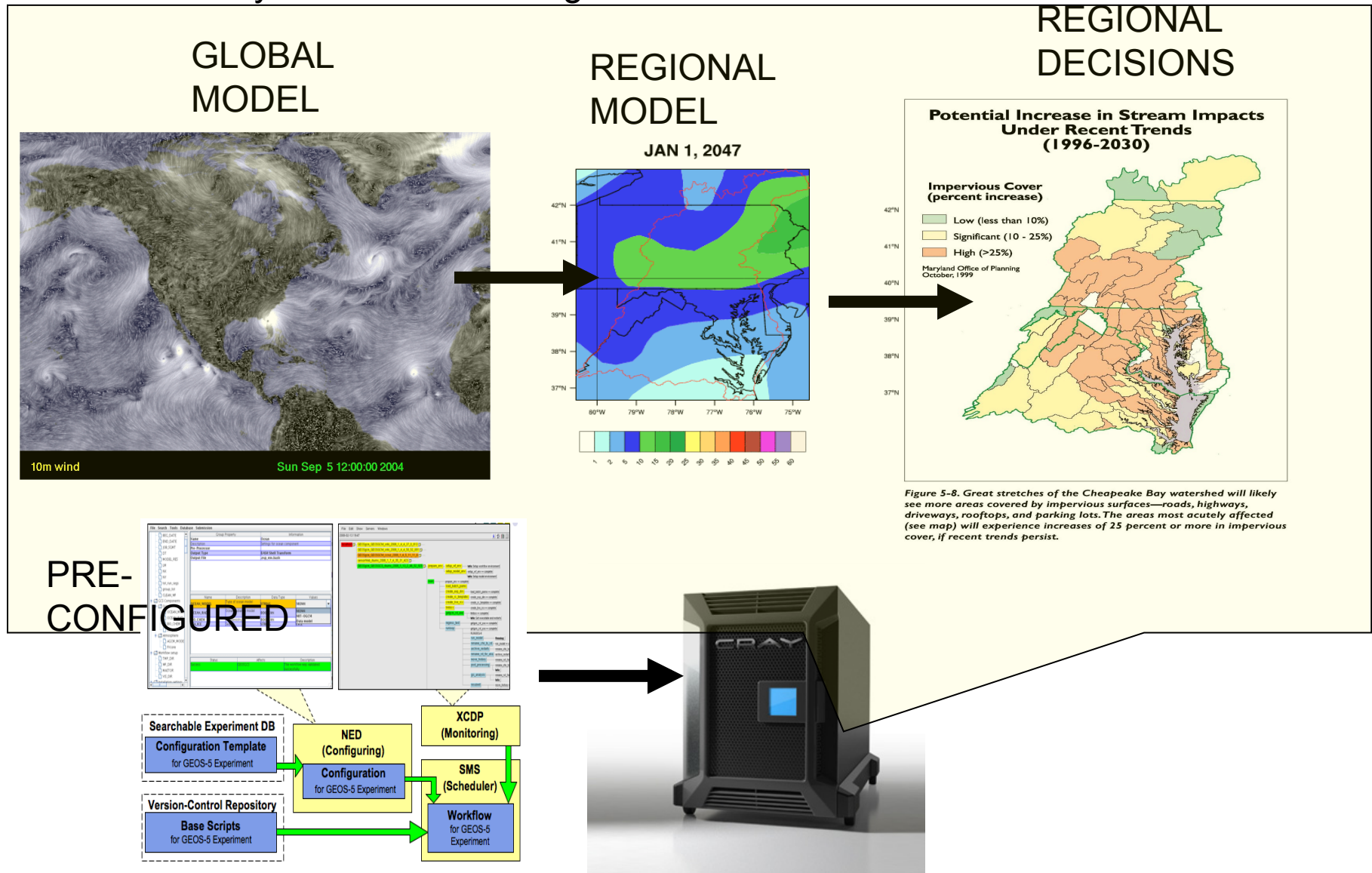
Lower the Bar for Entry – Application Users

- Low cost computing platform (e.g. Cray CX1 w/ MS HPC 2008 or Redhat Linux)
- Pre-configured Model Interfaces
  – Global Climate to Regional to Local If-Then Applications
  – Chesapeake Bay Is Single Use Case (other examples: energy, agriculture insurance, transportation, etc.)
- Pre- Configured Modeling Workflow Hides Model Complexity
  – Interfaces Validated for Applications
  – Collaborative Hind-Casting Testing versus MERRA data
  – Share experiment designs
- Visualization Products via WMS/WCS/GIS Type Interfaces
- Remote Link to Large Scale Ensembles Runs on Large Scale Computing Facilities (e.g. Larger Numbers of CPUs needed for Ensemble Global Runs, Driving Cray WRF/Regional Models)
- Demonstration Project Taken to Applications Community to Identify Additional Specific Use Cases

Climate in a Box: Application Users

Dynamic Downscaling: Scales That Matter to Decisions

GLOBAL MODEL

10m wind   Sun Sep 5 12:00:00 2004

REGIONAL MODEL

JAN 1, 2047

REGIONAL DECISIONS

Potential Increase in Stream Impacts Under Recent Trends (1996-2030)

Impervious Cover (percent increase)
- Low (less than 10%)
- Significant (10 - 25%)
- High (>25%)

Maryland Office of Planning October, 1999

Figure 5-8. Great stretches of the Cheapeake Bay watershed will likely see more areas covered by impervious surfaces—roads, highways, driveways, rooftops, and parking lots. The areas most acutely affected (see map) will experience increases of 25 percent or more in impervious cover, if recent trends persist.

PRE-CONFIGURED

Searchable Experiment DB
Configuration Template for GEOS-5 Experiment

Version-Control Repository
Base Scripts for GEOS-5 Experiment

NED (Configuring)
Configuration for GEOS-5 Experiment

XCDP (Monitoring)

SMS (Scheduler)

Workflow for GEOS-5 Experiment

CRAY

Thinking Beyond the Box

- It's not just a tool kit. It's a playground.
- If you build your sand box in the playground, it will fit into other playgrounds.
- It's a social experiment to build a common not only for model developers but also for model users, data providers, and application users.
- Think about the Intel cluster ready program.
- Think about Microsoft Developer Network.
- Social networking will be key to success.
- A new value system must be developed.